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The Big Picture

The word "telecommunications," a twentieth century amalgam of Greek and Latin roots, literally means the art of conveying information "from a distance." For millennia, people had to rely on messengers to perform this task, which was as costly per message sent as it was time-consuming. When the Greeks repelled the Persians at Marathon in 490 B.C., the legendary messenger Pheidippides could not shout the good news back to Athens, for it was 26 miles away, nor could he call anyone up, for there were no telephones; instead, he had to run. Several hours later, Pheidippides arrived in Athens, gasped out the news, and died of exhaustion. There had to be a better way—but, for the next 2300 years or so, sending a flesh-and-blood messenger on a trip was the normal method of delivering information from one place to another.

One dramatic break from that convention appeared in post-revolutionary France. In the early 1790s, Claude Chappe invented a system of relaying *visual* messages hundreds of miles across the French countryside over a network of towers spaced about 20 miles apart. For example, someone in Paris would manipulate the mechanical arms at the top of one of these towers to spell out a coded message; his counterpart in another tower 20 miles away would read the message and duplicate it for the benefit of the person manning the next tower down the line, and so on. Weather permitting, this system could be used to transmit a message from Paris to the border of Germany within ten minutes. Other societies had used visual communications techniques before, such as ship-to-ship semaphore signals and such land-based mechanisms as smoke signals and torches. But the French, quickly joined by several other European countries, improved greatly on the idea by developing a nationwide communications *network*. By the Napoleonic era of the early 1800s, the French had developed a

sprawling system of towers with six arms radiating from Paris to such far-flung destinations as Cherbourg, Boulogne, Strasbourg, Marseille, Toulouse, and Bayonne.[1]

Before long, these networks, which could be used only in daylight and good weather, confronted the first revolutionary technology in telecommunications: the telegraph. Developed by Samuel Morse in the 1830s, the telegraph sent encoded messages down copper wires by rapidly opening and closing electrical circuits. The telegraph dominated telecommunications until it too was gradually replaced by the next revolutionary technology: the telephone system, invented by Alexander Graham Bell in 1876 and widely deployed throughout much of the United States within a generation. In the 1890s, Guglielmo Marconi exploited the discovery that the airwaves, like copper wires, could propagate electromagnetic signals, and "radio" technology was born.

Today, although precise definitions differ, "telecommunications" is broadly defined as the transmission of information by means of electromagnetic signals: over copper wires, coaxial cable, fiber-optic strands, or the airwaves. This technology—which underpins radio and television, the World Wide Web, e-mail, instant messaging, and both wireless and wireline telephone service—is the *sine qua non* of contemporary global culture. But telecommunications is also a uniquely volatile field, economically, technologically, and politically. The disputes that arise within and among the different sectors of the telecommunications industry, often in response to these rapidly changing conditions, have triggered some of the fiercest public policy wars ever waged. In the United States, the very structure of the industry turns on the decisions of various regulatory authorities, most notably the Federal Communications Commission (FCC).

As Nicholas Lemann wrote not long ago in the *New Yorker*: "Of all the federal agencies and commissions, the [FCC] is the one that Americans ought to be most interested in; after all, it is involved with a business sector that accounts for about fifteen percent of the American economy, as well as important aspects of daily life—telephone and television and radio and newspapers and the Internet."[2] The policy questions answered at the FCC and elsewhere influence not just how we communicate with one another and what we do or don't watch on TV, but the fate of an industry that, in the United States alone, accounts for hundreds of billions of dollars in annual revenues and more than a million employees.[3]

As Lemann notes, however, "[i]t's an insider's game, less because the players are secretive than because the public and the press—encouraged by the players, who speak in jargon—can't get themselves interested."[4] Non-specialists also confront a vexing conundrum in trying to learn this field: to comprehend the whole of telecommunications policy, one must first understand its parts; but to understand the parts, one must first comprehend the whole. This chapter aims to overcome these difficulties by covering the major themes of telecommunications competition policy in enough depth, and with spare enough use of jargon, to help non-specialists understand how each of the policy issues discussed in subsequent chapters fits into the big picture. To this end, the first part of this chapter introduces the peculiar economic characteristics of the telecommunications industry that drive most forms of regulation in the United States. The second part then introduces the market-transforming phenomenon of "convergence"—the competitive offering of familiar telecommunications services through unconventional technologies, such as the provision of telephone service over high-speed cable connections to the Internet.

I. Economic Principles

Why does competition in the telecommunications world—unlike, say, competition in the world of home appliance manufacturing—present public policy issues of such importance and dizzying complexity? To answer that question, we must ask a still more basic question: What would happen if the government just left the telecommunications industry alone—no regulation of the retail rates charged by telephone companies, no antitrust enforcement against monopoly abuses, no government intervention whatsoever?

The answer to this question is controversial. Some free market proponents claim that, if only Congress were to abolish the FCC and stand out of the way, Adam Smith's invisible hand would trigger a consumer-friendly explosion of diverse telecommunications products at efficiently low prices.[5] Others claim that the government needs to intervene much more than it already does to protect consumers against consolidation and monopoly.[6] As will become clear in the pages that follow, we stake out a middle ground. Our thesis is that facilities-based competition will warrant comprehensive deregulation of the telecommunications industry over time,

but that deregulating it now, completely and instantaneously, would produce serious market failures and harm consumers.

Understanding this debate requires a familiarity with the basic economic phenomena that regulators have long cited to justify government intervention in telecommunications markets. At the risk of some oversimplification, we will sum up the most important of these phenomena in three concepts: network effects, economies of scale and density, and monopoly leveraging. We address each of those concepts in turn.

A. Network effects and interconnection

Flash back about 100 years to the infancy of the U.S. telephone industry. Different telephone companies often refused to interconnect with one another, and each had its own set of subscribers. Few consumers, of course, wanted to buy several telephones—and pay subscription charges to several telephone companies—simply to make sure they could reach anyone else they wished to call. Unfortunately, this was the choice many consumers faced in the early 1900s.

Such arrangements are quite wasteful in that they misallocate society's scarce resources away from their most productive uses. To be sure, the prospect of extra profits from the successful deployment of a closed (non-interconnected) telephone network may well have encouraged some entrepreneurs to build a better product and reach customers more quickly than they otherwise would.[7] Apart from those incentive effects, however, consumers typically received little added value from multiple subscriptions that they would not have received from one subscription to a single carrier if the various networks were interconnected and exchanged traffic at reasonable rates. For the most part, consumers simply paid more money for the same thing, which meant that they had less money to spend on purchasing things of value in other markets.

In the absence of any interconnection obligation, virtually every telephone market in early twentieth century America reached a "tipping point," in which the largest network—the one with the greatest number of subscribers—became perceived as the single network that everyone had to join, and the rest withered away. The potential for certain industries to slide into monopoly in this manner illustrates an economic phenomenon known as *network effects*. In many markets, individual consumers care

very little how many *other* consumers purchase the same products that they buy. For example, the bottle of shampoo you just bought does not become significantly more or less valuable to you as the number of other purchasers of the brand increases or falls. The telecommunications industry, like several other "network industries," is different: the value of the network to *each* user increases or decreases, respectively, with every addition or subtraction of *other* users to the network.

Suppose, for example, that you lived in a midwestern American city in 1900, and there were two non-interconnecting telephone companies offering you service. You would be much more inclined (all else being equal) to select the company operating 80% of the lines rather than the one operating 20% because the odds would be much greater that the people you wished to call would be on the larger network. The absence of interconnection arrangements among rival networks thus creates a cut-throat race to build the largest customer base in the shortest time frame—and then put all rivals out of business by pointing out the dwindling value of their shrinking networks. Economies of scale—a carrier's ability to reduce its per-customer costs by increasing its total number of customers—further accelerates this process by permitting larger carriers to undersell smaller ones in the market.

By the early twentieth century, the U.S. telephone market had "tipped." In most population centers, the victor was the mammoth Bell System: a collection of very large "operating companies" that provided local exchange services and were eventually bound together by a long distance network known as Long Lines. All of the far-flung operations of the Bell System were owned by American Telephone & Telegraph (AT&T), which maintained its own equipment manufacturing arm (Western Electric) and also, for a time, held the rights to patented technologies developed by the Bell System's creator and namesake.

In the areas AT&T did not control, which typically were the less populous ones, the so-called "independent" local telephone companies vied for market share. In many cases, AT&T sought to coerce these independent companies into joining the Bell System by refusing to interconnect them to AT&T Long Lines, which was then the only long distance network in the United States. The independent companies were in no position to build a rival long distance network. Even if they could have cooperated to construct the needed transcontinental facilities (and done so without infring-

ing any remaining AT&T patents), they still could not have used that shared network to send calls through to the increasing majority of Americans who were served by local exchanges owned by the non-interconnecting Bell System. As a result, without interconnection rights, these independent companies could not provide their customers with satisfactory telephone service—i.e., service extending beyond the local serving area—unless they could somehow duplicate the nationwide physical infrastructure the Bell System had built up over several decades of sharp dealing and self-reinforcing good fortune. That was an economic impossibility.

AT&T's coercion of the independent companies ultimately aroused the attention of the Justice Department's antitrust authorities. In the Kingsbury Commitment of 1913, AT&T resolved the dispute by agreeing to interconnect its Long Lines division with these independent local companies and to curb its practice of buying up independent rivals.[8] In exchange, the government placed its effective imprimatur on AT&T's monopoly control over all U.S. telecommunications markets in which it was already dominant. This incident is noteworthy not just because it illustrates the monopolistic tendencies of an unregulated telephone industry, but also because it provides an instructive contrast to the anticompetitive conduct that ultimately led to the breakup of the Bell System 70 years later into its local and long distance components. In 1913, AT&T used its control of the *long distance* market to suppress other *local* carriers. As explained below, AT&T would later leverage its control of most *local* markets to suppress the *long distance* competition that technological advances had made possible by the 1960s.

The network effects phenomenon presents different competitive questions in different industries, and reasonable people can disagree about when the government should require a firm to share access to its customer base. But when such intervention is deemed necessary, the usual solution is an interconnection requirement. Suppose you own a telephone network and one of your subscribers wants to place a call to someone who subscribes to Provider X's network. If Provider X's network is larger than yours, it may have the incentives just described to refuse to interconnect, in which event your subscriber learns that the call has failed—and considers defecting to Provider X. But if the government forces Provider X to take the call onto its network and route it to the intended recipient, your customer remains satisfied, and you stay in business. Interconnection obligations work the other way as well: Provider X cannot preclude its subscribers from reaching yours.

If dealing with network effects were as simple as decreeing that all competing carriers "must interconnect," telecommunications regulation would not be so complex. But many critical details need to be worked out to ensure that two networks cooperate efficiently. For example, when you, the owner of the smaller network, hand off calls for completion by the larger network, how much—if anything—should that larger network be able to charge you for this task? That may seem like a simple question, but it is theoretically quite complex, and answering it incorrectly can have debilitating consequences, as chapter 9 explains.

The physical details of interconnection arrangements can also raise a number of thorny issues. There are many subtle ways in which a larger network operator can disadvantage a smaller one through shoddy interconnection arrangements, such as providing only limited capacity within its interconnection facilities for the receipt of calls from you, the smaller carrier. Your subscribers might then receive an "all circuits busy" signal when they try to call the larger carrier's subscribers during peak calling periods—leaving them, once more, dissatisfied and tempted by the prospect of defection. To prevent such problems, regulators often need to develop rules to govern the operational details of interconnection arrangements and penalize non-compliance.

Although we have focused so far on the telephone industry, network effects are endemic to information technology industries generally, and there are ongoing debates about when, if ever, the government should step in to address any anticompetitive consequences. Consider the market for instant messaging. The key to instant messaging technology is a centralized database, known as a "names and presence directory," which allows a service provider to tell its subscribers when their designated "buddies" have logged on to the same provider's network and are available for a kind of e-mail exchange in real time. So long as each such directory is proprietary to a particular firm and unshared with others, subscribers are likely to value an instant messaging service in direct proportion to the number of their "buddies" who are also subscribers to the same service. This dynamic tends to favor the service provider with the largest customer base, which, in the United States, has traditionally been America Online (AOL).

When it approved AOL's merger with Time Warner in 2001, the FCC expressed concern that the instant messaging market was tipping and that AOL's instant messaging systems—and particularly, in the U.S., "AOL

Instant Messenger"—had accumulated such a large subscriber base that users of instant messaging would feel compelled to choose AOL as their provider. The FCC was particularly alarmed that AOL had dragged its feet in designing an interconnection mechanism that would enable the subscribers of other services to make use of AOL's proprietary names and presence directory and communicate with AOL's subscribers as freely as with each other. Some people cited AOL's reluctance to interconnect as conclusive evidence that the company itself perceived the instant messaging market as likely to tip and produce a lucrative AOL monopoly. As the FCC's then-chief economist later explained: "If it is a more competitive market, the incentive is for all the players to interoperate. There is a mathematical proof on that one."[9]

In the end, the FCC stopped short of ordering AOL to interconnect with its rivals for the generation of instant messaging services that had become familiar to many American consumers. Controversially, however, the FCC did impose an "interoperability" condition for any "advanced," video-oriented applications of instant messaging using high speed Internet services.[10] Instant messaging programs, the FCC reasoned, can be modified to serve as "information platforms" for all sorts of communications applications, including video conferencing; indeed, some people believed that instant messaging would gradually supplant the telephone as the dominant means of person-to-person communication. The FCC feared that, unrestrained by interconnection obligations, AOL's proprietary systems would become *de facto* standards and would become indispensable to residential and business users over time. The FCC thus worried that AOL would end up monopolizing portions of the telecommunications market much as AT&T's Bell System had done almost one hundred years before and would raise consumer prices dramatically once it had succeeded. As AOL's share of instant messaging users steadily declined in the early 2000s, these concerns began to seem overblown and the FCC lifted the interoperability requirement.[11] But such concerns reveal the unusual sensitivity of regulators to the monopolization threat posed by network effects in the communications industry.

One of AOL's fiercest opponents in the instant messaging debate was Microsoft, which offered its own proprietary brand ("MSN Messenger") and had repeatedly tried and failed to interconnect with AOL's instant messaging network. There was no small irony here, for Microsoft was simulta-

neously defending itself in court against the Justice Department's claims that, in subtly similar ways, it had abused its dominance in the market for personal computer operating systems.

The dominance of Microsoft Windows in today's personal computer market arises from network effects and, specifically, from what antitrust courts have called the *applications barrier to entry*.[12] At some point in the 1980s, software designers realized that more users were choosing Microsoft's operating systems than the alternatives, a choice cemented by Microsoft's eventual development of the Windows "graphical user interface." In response, more and more applications developers created programs only for Windows, leaving would-be rivals (like IBM) to sell operating systems that did not have as many programs designed for them and were therefore less popular. As a result, Microsoft won an increasing share of the operating system market. That, in turn, reinforced the software designers' predictions about the dominance of Windows and their desire to produce applications for it, often to the exclusion of applications for rival operating systems.[13]

In these and other contexts, reasonable people can disagree about whether network effects create any problems for which the government should offer a solution. The proponents of government intervention argue that monopolization is virtually always an evil to be avoided, reasoning that monopolization of any industry necessarily produces higher consumer prices, less product variety, and lower quality. Opponents of government intervention, by contrast, point to a theory of competition, first developed by economist Joseph Schumpeter, that focuses on the "creative destruction" of old incumbents by new insurgents, who are rewarded with monopolies of their own until knocked off their perch by the next round of insurgents.[14] Under this theory, the most significant competition takes place not *within* a market—in the form of price wars or incremental increases in quality—but *for the market itself:* i.e., in establishing the next great invention that will displace the old monopoly with a new one.[15]

The first key premise of the modern-day Schumpeterian perspective is that, in high-tech industries, the next industry-transforming technology could arise at any moment to eclipse the products of today's monopolists.[16] This threat is said to give current monopolists powerful incentives to keep their products as efficient and consumer-friendly as possible. The second key Schumpeterian premise is that the best way to induce entrepre-

neurs to risk enormous sums in developing revolutionary technologies is to welcome the prospect of a temporary monopoly when those technologies succeed. Because they view temporary monopolies favorably, modern-day Schumpeterians argue for strong intellectual property protection and freedom from both competition-oriented regulation and aggressive antitrust enforcement.[17] As Richard Posner has put it: "The gale of creative destruction that Schumpeter described, in which a sequence of temporary monopolies operates to maximize innovation that confers social benefits far in excess of the social costs of the short-lived monopoly prices that the process also gives rise to, may be the reality of the new economy."[18]

Although network effects can dramatically influence the course of competition in information industries, the arguments for and against government intervention to counteract that influence are subtle and specific to each individual market. Nonetheless, today there is broad consensus that the government should impose interconnection obligations on ordinary telephone networks. One reason for this is that the telephone market, with its high fixed costs, is characterized not just by network effects, but also by enormous *economies of scale and density* (which we discuss below). Without interconnection rights, a new provider could not offer its customers effective telephone service—i.e., service capable of reaching all the people those customers wish to call—unless the provider first builds a new, ubiquitous physical network whose geographic scope rivals that of the dominant network, and then finds some way of underwriting that network without passing on its unusually high per-customer costs to its initially small customer base. To articulate this challenge is to reveal the economic near-impossibility of meeting it.

B. Economies of scale and density

Although our discussion treats "network effects" and "scale economies" as two separate phenomena, they are in fact closely related. Each describes a characteristic of markets in which, all else held constant, increasing the scale of a firm's operations improves the ratio of (i) the value of the firm's services to each customer, and thus the revenues the firm can obtain from that customer, to (ii) the per-customer cost to the firm of providing those services. Network effects improve this ratio by increasing the value of the

service to each customer, whereas scale economies improve it by decreasing the per-customer cost of providing that service. In the absence of regulation, each result would play a powerful role in favoring larger scale telecommunications firms over their smaller rivals.

Interconnection obligations significantly lower the entry barriers posed by the combination of network effects and scale economies because, as discussed, they exempt a new entrant from the need to build a ubiquitous network before competing for the dominant carrier's customers. But interconnection obligations do not eliminate those entry barriers altogether. Although they reduce any advantage that incumbents derive from network effects, they do not ensure that new entrants will benefit from the enormous scale economies enjoyed by a provider with a large, established customer base. As discussed below, the lion's share of controversy about the Telecommunications Act of 1996 stems from disagreement about how best to deal with this concern.

Any telecommunications carrier contemplating the construction of a new network faces immense initial costs, including, for example, the costs of digging trenches and laying thousands of miles of cable to reach different customer locations. These costs are both *fixed*, in that the carrier must incur them up front before it can provide any volume of service, and *sunk*, in that, once made, the investment cannot be put to some other use—a fact that makes the investment particularly risky.[19] In contrast, the marginal cost of providing service to each additional customer, once the network is up and running, is often tiny by comparison. Given these enormous fixed costs and negligible marginal costs, the carrier's long run average costs within a defined geographic area—i.e., its long run costs per line in service—may well decline with every increase in the size of its network, all else held constant. Put differently, it is often cheaper per customer for a carrier to provide service to the one millionth customer than to the one thousandth customer.

Closely related to such economies of scale are economies of density. These are best explained by way of example. Imagine a 1000-unit beach condominium complex that is both distant from any telephone company switching station and, because of zoning restrictions, isolated from other buildings. If the fixed costs of laying a cable from the nearest switch to that complex were $100,000, a single telephone provider serving the entire

complex could spread the recovery of those costs among all 1000 subscribers for a cost of $100 per subscriber. But if ten providers divided up that customer base equally after laying their own cables to the same complex—each digging up the streets at different times and incurring the same fixed $100,000 cost—the average cost of that ten-fold effort would rise to $1000 per customer, for each provider could spread its $100,000 costs only over 100 customers rather than 1000.* In this respect, economies of density can be roughly conceptualized as scale economies within a particular geographic area, such as the condominium complex in our example. For ease of exposition, we will use the term "scale economies" broadly to include these economies of density.[20]

Of course, high fixed costs and low marginal costs lead to large scale economies in many industries, from auto manufacturing to applications software production, and most such industries have never been subject to pervasive schemes of prescriptive economic regulation. The difference is one of degree. In some settings, scale economies do not increase "over the entire extent of the market,"[21] for there are diminishing returns to scale at some level of production. In other settings, however, scale economies keep increasing until a provider is serving all customers in the market. In that context, because a single firm can serve the whole market (however defined) with lower overall costs per customer than could multiple firms, the market is said to be a *natural monopoly*.[22]

The government has traditionally addressed such a market by awarding a monopoly to a single firm and heavily regulating it, on the theory that

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* Economies of density also explain why telephone service is much more costly to provide in rural than urban areas. Suppose your company runs a telecommunications network on a rigidly fixed budget. Would you rather (1) build one line to each of 1000 customers living on widely dispersed farms or (2) 1000 lines to one apartment building with 1000 units? Even if the average line length were the same in each example (say, because the apartment building is farther away from your switching station than half of the farms), you would still much rather serve the apartment building because you would only have to dig up the ground once to lay the lines needed to serve those 1000 units. If you picked the farms option, you would need to dig up the ground many more times to lay 1000 different cables, and you would have to pay far more to obtain the rights of way as well (although the lower rural land values would slightly offset those higher costs).

this is the best way to keep consumer prices low. As Richard Posner once explained, in describing a similar phenomenon in the cable television business:

> You can start with a competitive free-for-all—different cable television systems frantically building out their grids and signing up subscribers in an effort to bring down their average costs faster than their rivals—but eventually there will be only a single company, because until a company serves the whole market it will have an incentive to keep expanding in order to lower its average costs. In the interim there may be wasteful duplication of facilities. This duplication may lead not only to higher prices to cable television subscribers, at least in the short run, but also to higher costs to other users of the public ways, who must compete with the cable television companies for access to them. An alternative procedure is to pick the most efficient competitor at the outset, give him a monopoly, and extract from him in exchange a commitment to provide reasonable service at reasonable rates.[23]

Similar considerations led regulators for many years to conclude—somewhat controversially in hindsight—that the whole telephone market was a natural monopoly in this sense and that the "alternative procedure" Posner described would be the optimal means of ensuring dependable service at low rates.

This natural monopoly premise provided a convenient solution to the problem of network effects as well. Because (the thinking went) there was no reason to allow a second or third provider into the same geographic market to begin with, since that would only dilute the incumbent's economies of scale, there was no need to worry about forcing the incumbent to interconnect with competitors. The principal exception, illustrated by the Kingsbury Commitment, seems almost trivial in this light: different geographic regions would be served by different monopoly providers of local service, and the government would ensure simply that neighboring monopolists interconnected with each other for the exchange of calls between their respective regions and that the national monopoly provider of long distance service (AT&T) allowed all of these monopolies access to the rest of the country.

Relying on this natural monopoly premise, many regulators not only refused to order interconnection among potential rivals, but straightforwardly prohibited new market entry by granting exclusive franchises to the

monopolists. In part, policymakers resisted competition not just because they believed in the economics of natural monopoly theory, but also because they relied on regulated monopolies to advance various social policies, most notably "universal service." For example, regulators deliberately kept prices for business customers high (compared to the underlying cost of serving them) as a means of cross-subsidizing affordable rates for other users, such as residential customers in rural areas where economies of scale and density are low.[24] As we will discuss later, this scheme can work over the long term only to the extent that rival providers are barred from competing for the business customers who pay the above-cost rates that subsidize low rates for others.

For many years, AT&T's Bell System invoked "universal service" concerns to persuade regulators to bar competition in all telephone-related markets, including equipment manufacturing as well as local and long distance services. Its long-lived regulatory success in this respect provides a classic case study in *public choice theory*—the economic analysis of relations between market participants and the government officials they seek to influence.[25] Public choice theory holds that private economic actors will exploit regulatory schemes to extract "rents" from policymakers: i.e., special benefits that arise from political influence rather than economically valuable contributions to social welfare. Successful rent-seeking need not, and usually does not, take the form of outright bribery. Instead, private actors look for ways to match their own pecuniary interests with the political goals of regulators. In the case of telephone regulation, the suppression of competition in the name of "universal service" gave AT&T what it wanted—formally protected monopoly status—and gave the regulators what they wanted: a hidden scheme for underwriting low residential rates that avoided all the political costs presented by a more explicit and tax-like system.[26] The victims of such Faustian bargains are consumers, who in the long run might well be better off, at least in the aggregate, if regulators made the hard political choices necessary to remove barriers to competition.

Starting in the 1970s, policymakers began questioning the natural monopoly assumptions that had been conventional wisdom almost since the inception of the industry.[27] This process followed a predictable pattern, as we will discuss in chapter 2. After the FCC adopted rules allowing competition in the provision of telecommunications equipment, the markets

that next fell prey to competition were the ones in which overall call volumes were so huge, and the incumbent's retail prices were so far above economic cost, that a competitor could efficiently build a rival network and earn large profits even though it had only a small share of the total customer base. The first such market was for business-oriented long distance services between major cities, a market that MCI and other firms entered in the 1970s and 1980s with the help of both microwave technology and the courts. The second was the market for so-called "access services": the high-speed links between local networks and long distance networks. In each case, the companies that owned the core "natural monopoly" assets—the local exchanges, with their "last mile" connections to every home and business in a given calling area—tried to thwart this nascent competition by (among other things) refusing to interconnect with the upstarts or by making interconnection unnecessarily burdensome. In each case, the U.S. government stepped in and mandated non-discriminatory interconnection.

Finally, in the Telecommunications Act of 1996, Congress seemed to dispense with the natural monopoly premise altogether. It abolished all exclusive franchises, ordered all telecommunications carriers to interconnect with any requesting carrier, and declared all "local exchange" markets—in addition to the long distance and "access" markets—open for competition. But Congress could not repeal the laws of economics. In many settings, it remained commercially infeasible for new competitors to build redundant "local" wireline networks bridging the last mile to all of their subscribers' buildings. The main exception to this rule lay in some local exchange markets—such as densely populated, downtown business districts—where high volumes of voice and data traffic enabled new entrants to exploit fiber-optic technology by building telecommunications networks all the way to their customers. In less densely populated areas, however, such as many suburbs and most rural areas, call volumes could not support the efficient construction of wholly duplicative networks replete with thousands upon thousands of wired connections to all homes and businesses. To be sure, firms were successfully building new *wireless* telephone networks in these areas, but, until recently, disparities in price and service quality have kept customers from replacing, rather than merely supplementing, their landline phones with wireless ones.

This tension—between (i) the competitive aspirations of the 1996 legislation and (ii) the stubborn economic characteristics governing the last

mile—is a central focus of the next two chapters. Congress attempted to resolve that tension in part by granting new entrants rights to *lease capacity* on the facilities owned by the incumbent telephone company, enabling them to "participate" in the incumbent's economies of scale by availing themselves of the same low per-unit costs. But Congress left all of the major decisions about such compelled leasing arrangements to federal and state regulators. Almost a decade later, there is no consensus about the most basic questions: which facilities a new entrant should be entitled to lease from incumbents, for how long, and at what price; and what to do if the relevant regulations are violated. These abiding controversies remain important to the future of the telecommunications industry, and chapter 3 and appendixes A and B address them in detail.

C. Monopoly leveraging and the concept of "information platforms"

So far, we have addressed the regulation of *horizontal* relationships within the telecommunications industry: the relationships between competing providers of substitutable services. Now we introduce the equally complex set of issues presented by *vertical* relationships between providers of communications-related goods or services in complementary ("adjacent") markets. These relationships arise across the economy: between, for example, wheat farms and bakeries, and between bakeries and grocery stores. Vertical integration by a firm across different markets is often desirable because it can produce significant *economies of scope:* cost efficiencies obtained by producing several products at once. In most industries, moreover, competition in each of the adjacent markets liberates these vertical relationships from the need for heavy governmental oversight. To the extent the government gets involved, it is typically through ad hoc enforcement of the antitrust laws.

The telecommunications industry has historically been different for reasons relating to the nature and regulation of the market for last mile services. Telephone companies and cable companies are often vertically integrated: they provide not just various last mile transmission services—the markets in which they are often dominant—but a variety of complementary services as well, such as Internet access, long distance voice service, and video programming. Competitive concerns arise when such

companies are asked to bargain with rival providers in those adjacent markets about the terms of access to their last mile facilities. Although many firms wish to sell you telecommunications-related services—say, long distance, Internet access, or video programming—you may not be able to accept any of their offers unless the local telephone or cable company agrees to transmit these firms' signals into your home or business. And your local telephone or cable company *may* have incentives to discriminate against these unaffiliated firms if it is simultaneously trying to sell you competing long distance, Internet access, or video programming services of its own.

The reason a monopoly provider of last mile transmission services might want to discriminate against providers of complementary services is not as obvious as it might seem. It is instructive to contrast such last mile providers with a monopoly firm like Microsoft. Although Microsoft has a monopoly in the operating system market (Windows), it lets other companies write a variety of software applications that ride on top of the Windows platform. Since the government does not regulate Microsoft's price for Windows, Microsoft can maximize its monopoly profits simply by charging supracompetitive prices in the operating system market that it monopolizes. Microsoft thus would not normally benefit from using its Windows monopoly to exclude unaffiliated software companies from designing applications that enhance the consumer value of Windows.

This scenario illustrates an economic insight, known as the *one monopoly profit* principle, identified with the nineteenth century French economist Antoine Cournot. This principle holds, among other things, that the total profits a monopolist could earn if it sought to leverage its monopoly in one market by monopolizing an adjacent market are equivalent to the extra profits it could earn anyway simply by charging more for the monopoly product itself.[28] Cournot illustrated this point by hypothesizing the relationship between separate zinc and copper monopolies and its effect on the "downstream" market for the alloy of those two elements: brass. As recently summarized by Berkeley economist Hal Varian: "If the copper producer cuts its price, brass producers will buy more zinc, thereby increasing the profits of the zinc producer. But the zinc producer's additional profits are irrelevant to the copper producer, making it reluctant to cut its price too much. The result is that the copper producer sets a price that is higher than the price that would maximize joint profits."[29] This means, among other things, that the zinc monopolist may well benefit from competition

in the copper market because, as the price of copper falls, it can appropriate more of the profit-maximizing price that is paid in the aggregate for the two constituent elements of brass.

Microsoft likewise benefits from encouraging other firms to develop new applications that run on Windows because so doing will drive additional demand for Windows and cement its monopoly grip on the operating system market. Put in economic terms, the benefit that a platform provider gains from added applications for its product is a *complementary externality*, which means the platform itself will be valued in direct proportion to the proliferation of complementary products, no matter what their source. Perhaps counterintuitively, the high-profile antitrust case against Microsoft is entirely consistent with these observations. Microsoft decided to crush Netscape not because Netscape had designed an ordinary Internet browser that could run on top of Windows (and thus enhance its value), but because Netscape had designed an Internet browser that could radically decrease the value of Windows. Microsoft feared that Netscape could eventually serve as a rival platform in its own right, on top of which end users could run software applications, regardless of the underlying operating system. Netscape, in other words, threatened to tear down the "applications barrier to entry" that protects Windows' monopoly: it could potentially reduce both the need for software companies to design applications specifically for Windows and the need for consumers to purchase computers with Windows installed.[30]

The telecommunications industry gives rise to similar issues. The basic question, which recurs in many different forms, is whether a dominant provider of a given telecommunications platform—such as last mile transmission to homes and offices—has appropriate incentives to let independent firms compete freely in adjacent markets, such as long distance service or Internet access.[31] One critical variable in answering that question is whether the dominant provider, like Microsoft, has reason to fear that an independent firm in an adjacent market could develop a product that threatens to supplant the platform monopoly itself. Another key variable is whether the platform service is—unlike Microsoft Windows—subject to price regulation. If so, the "one monopoly profit" phenomenon will not apply, and the provider may well have incentives to discriminate against firms in adjacent markets, because it will be unable to recoup all otherwise available monopoly profits from the sale of the platform itself and will need to extract them instead from those other markets.

This latter exception to the "one monopoly profit" rule is sometimes called *Baxter's Law* in honor of William Baxter, the Justice Department official who cited it, in the early 1980s, as a reason for breaking up AT&T's Bell System to keep it from leveraging its monopoly in local markets to suppress competition in the adjacent long distance market. The problem arose largely because, as discussed, AT&T was allowed to charge above-cost prices for long distance service, telecommunications equipment, and various other products to compensate for the very low rates its Bell affiliates were forced to charge for local residential service. This scheme could work only if other firms could not compete for the customers that were paying above-cost prices. Thus, when new entrants such as MCI sought to enter the long distance market to compete for those customers, AT&T opposed MCI's efforts on the ground (among others) that it would endanger the traditional commitment to "universal service" by removing the source of support for the local services it was sometimes required to provide below cost.

The efforts of AT&T's pre-divestiture Bell System to disadvantage these rivals led to an antitrust suit by the federal government that changed the face of telecommunications regulation. After many years of litigation, AT&T ultimately entered into a consent decree under which it divested the regional Bell companies in January 1984. The new corporate entity that inherited the AT&T name kept Long Lines, the research and equipment manufacturing arms later spun off as Lucent Technologies, and a few other units. The Bell operating companies kept the local exchanges but were subject to various restrictions on the lines of business they could pursue, including a ban on the provision of long distance services and the manufacture of telecommunications equipment. This quarantine was an aggressive remedy—but, as discussed in chapter 2, the antitrust authorities concluded that it was necessary to counter the tendency of AT&T's vertically integrated Bell System to discriminate against long distance and equipment manufacturing competitors. The individual Bell companies began winning approval to enter the markets for long distance service and equipment manufacturing fifteen years later, after proving to the FCC on a state-by-state basis that they had opened their local exchange markets to competition and had set up separate long distance affiliates as a structural safeguard against discrimination. This process, governed by sections 271 and 273 of the Communications Act, is described more fully in chapter 3.

During the same general period as the AT&T divestiture, the FCC adopted somewhat less radical measures to deal with the perceived threats of monopoly leveraging that telephone companies posed to "enhanced service providers," which include such companies as Lexis-Nexis, voicemail providers, and—most important of all—what we now call "Internet service providers" (ISPs). In orders known collectively as the *Computer Inquiries*, the FCC required each telephone company, among other things, to sell enhanced service providers whatever basic transmission services it provides to its own enhanced service operations and on the same terms. Until recently, this policy could be justified as another straightforward application of Baxter's law. The telephone company's transmission services were price-regulated, and its network was long considered an indispensable bridge between enhanced service providers and their customers.

In the late 1990s, however, the emergence of broadband (high-speed) Internet access began drawing that justification into question. Such access is *not* generally subject to price ceilings. Just as important, it is offered not just by telephone companies, but by competing providers with technologically dissimilar transmission platforms as well, such as the "cable modem" service offered by cable television companies. As discussed in chapter 5, a key dispute in telecommunications policy today is the extent to which traditional anti-leveraging rules will remain appropriate as broadband eclipses traditional dial-up connections as the Internet access method of choice.

Our discussion of monopoly leveraging has focused so far on the last mile transmission services provided by telephone companies because, until recently, there was little doubt that those companies owned the only feasible path to consumers for certain telecommunications-related services. But leveraging issues have also cropped up in various other settings within the communications industry.

For example, the FCC has struggled for years to justify caps on the size of cable television companies. (Related limits, which the Commission controversially relaxed in June 2003, also apply to the ownership of television broadcast stations, as discussed in chapter 11.) The theory underlying these "horizontal ownership restrictions" is that the local cable company is dominant in any given geographic area in the provision of multi-channel video programming to the home. Congress and the FCC feared that, if any one cable company (say, Time Warner) served too large a share of the American

public, that company could exert undue influence in the market for television programming by, for example, giving preferential treatment to its own affiliated studios (say, HBO).[32] By adopting rules to limit the extent to which a single firm can own multiple cable systems, the FCC sought to limit the creation and exercise of "monopsony" power (i.e., dominance in the purchasing market) that could doom independent programming studios, which cannot finance the creation of television shows unless those shows can be expected to reach a critical mass of the viewing public.

In 2001, the D.C. Circuit[33] invalidated the FCC's decision to limit the subscribership of any one cable company to 30% of the total number of subscribers to multi-channel video programming services (i.e., cable plus satellite). The court concluded, among other things, that the FCC's underlying economic reasoning—dubbed "antitrust lite" by its critics—had underestimated the emerging significance of satellite television services as an alternative platform for independent programming. Even though the number of cable subscribers dwarfs the number of satellite subscribers, Judge Stephen Williams, writing for the court, explained that "a company's ability to exercise market power depends not only on its share of the market, but also on the elasticities of supply and demand, which in turn are determined by the *availability* of competition. . . . If [a cable company] refuses to offer new programming, customers with access to [satellite service] may switch."[34] That possibility, in turn, may cause even very large cable companies to worry less about dominating the programming market than about reinforcing the value of their cable "platform" by purchasing attractive programming for its viewers—without regard to which studio created it.

Throughout this book, we will return to this basic scenario: a firm that dominates a platform market, and is regulated on the premise that it could leverage that platform dominance to control an adjacent market for applications, becomes subject to competition from the provider of a new alternative platform made possible by technological innovation. Such competition can suddenly arise to confront any dominant platform, from the conventional cable television platform we have just discussed (now contested by satellite TV services), to the telephone platform used for Internet access (now contested by cable companies), to AOL's instant messaging platform (threatened by Microsoft's and Yahoo's instant messaging

products), to Microsoft's operating system platforms (threatened by "open source" operating systems such as Linux).

The unpredictable growth of such *cross-platform* competition in previously monopolistic industries presents policymakers with several critical challenges.* Despite political pressures and bureaucratic inertia, they must (i) judge how strongly entrenched a proprietary information platform might be; (ii) weigh the benefits of anti-leveraging regulation against the costs of dampened incentives to innovate in a sometimes Schumpeterian world of "serial monopolies"; (iii) calibrate any regulations they do adopt to the actual leveraging threat the platform poses to applications markets; (iv) act promptly in modifying or withdrawing those anti-leveraging regulations once platform competition develops; and (v) remain wary of the administrative costs inherent in market intervention and of the unintended consequences of poorly designed regulation. On the one hand, regulators understandably want to adopt policies that will promote welfare-maximizing competition over the long term. On the other hand, they do not want to interfere with market forces in a way that will undermine the incumbents' own efforts to create consumer value. Incumbents often stand in the best position to develop valuable new products for consumers, and excessive regulation can stop that innovation in its tracks. Similarly, if regulators react too slowly in modifying regulations that mistakenly presuppose that a once-monopolistic platform has no rivals, they will artificially advantage the rival platform provider in its efforts to steal customers off the incumbent platform. We now turn to this question of *regulatory parity* in a world of rapidly evolving telecommunications technology.

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* Many commentators and the FCC use the term "intermodal competition" to describe competition among technologically dissimilar platforms. We prefer the somewhat broader term "cross-platform competition." From a competition policy standpoint, the most important issue is whether an incumbent faces facilities-based competition in the form of a rival platform, not what particular technology ("mode") the rival might use. At the same time, the particular technology used to enter the platform market may have important consequences under any regulatory regime, since the new technology may well be immune from legacy regulations applicable only to the traditional platform provider.

II. Convergence

Very roughly speaking, most forms of telecommunications fall into one of two general categories. *Point-to-point* communication involves the transmission of content—e.g., the placement of a "call"—from a person or machine to a discrete recipient. Examples include ordinary telephone calls and fax transmissions. *Broadcasting* involves the transmission of content to the world at large, or at least anyone who cares to watch or listen. Examples include television and radio programming. This dichotomy has always been a bit of an oversimplification, and the Internet—with its mass e-mails and simultaneous webcasting—has blurred the distinction still further. But most forms of telecommunications today still fall into one of these two categories, particularly if we broadly construe the "points" in "point-to-point" communications to include moving cellular telephones.

For most of the twentieth century, people closely identified each of these categories of service with a particular medium of transmission. In particular, they assumed that commercial point-to-point voice services ("telephony") would be conveyed over the copper wires of the telephone system, and that radio and television broadcasting services would be provided over the airwaves. The Communications Act of 1934 was originally written with this assumption in mind. Congress designed Title II of the Act to govern wireline "common carriers"—i.e., the companies that provided telephone service indiscriminately to the public at large. And it designed Title III to govern "radio communications," a category that grew to encompass both radio and television broadcasting. Under Title III, the FCC licensed radio and television stations to use the airwaves to broadcast programming "in the public interest."

And so the world remained until the 1960s, when something peculiar happened: companies increasingly began to transmit television signals not over the airwaves, but over wires. For a long time, such "cable television" service provided no new programming; it was designed only to transmit stronger signals of conventional broadcast programming to people whose homes were too far away from a transmission tower to receive clear pictures (or any pictures). Even so, the seeming anomaly of wires being used for broadcasting threw the regulatory world into tumult, for it raised questions about how the FCC could legally follow through on its expressed intent to regulate this new creature and preempt contrary state and local

regulation. After all, Title II addressed common carriage, not broadcasting, and Title III addressed use of the airwaves, not wires.

The FCC ultimately asserted what it called its "ancillary jurisdiction" to regulate anything that affected the explicit subjects of its regulatory authority. In this case, the FCC concluded that because cable television transmissions affected commercial over-the-air broadcasting, the Commission had the right to regulate them under the general enabling authority provided in Title I of the Act. In 1984, long after the Supreme Court upheld the exercise of this strikingly open-ended regulatory authority (in 1968),[35] Congress stepped in and added a new Title VI to the Communications Act to govern federal, state, and local regulation of cable television services.

In the 1980s, "cellular" wireless technology gave consumers an altogether new means of placing telephone calls. This technology uses the radio spectrum—long the province of specialized broadcasts by taxi dispatchers and policemen in addition to television and radio stations—for regular communications among members of the public at large. This development produced another anomaly unanticipated in the structure of the 1934 Act: the use of the *airwaves* to provide a common carrier-type service. Congress eventually patched this hole by adding provisions to Title III to govern the regulation of this new service.

The use of radio signals to carry telephone calls, and of wires to carry broadcast programming, are examples of *technological convergence*: the coming together of different technologies to provide similar services. But the examples of convergence just discussed are tame in comparison to the upheavals triggered by the Internet. By placing a "call" over your Internet connection to a distant website, you can listen, along with the citizens of Prague, to the broadcast of a Czech radio station. With a click of the mouse, you can sign on to Launch.com, an interactive Yahoo!-sponsored music service that keeps track of the music you like and sends you—and you alone—a personalized stream of songs. With another click of the mouse, you can chat with a friend across the world through instant messaging. Alternatively, by plugging special telephone hardware into any broadband connection, you can speak to the same friend using *voice over Internet protocol* (VoIP) services that are so clear and refined that, for all practical purposes, you may as well be talking over a traditional telephone circuit. And, so long as you have a broadband connection of some type,

you can do all these things no matter how the Internet signals come into your home: whether through your telephone line ("digital subscriber line" or "DSL"), your television cable ("cable modem"), a high speed wireless connection, or someday even your electric power line.

The contemporary forms of convergence are largely the result of digital technology, which came of age commercially in the 1980s and 1990s. As chapter 4 discusses in depth, digital technology provides concise mathematical representations of the world, in the form of 1s and 0s, that software inside your computer decodes and converts into everything from voice conversations to photographs to documents to Prague radio broadcasts. The Internet forms a convenient means of transporting those 1s and 0s, also known as *bits*, between computers (or other devices with data processing capability). The computers on each end of a data session do not "care" what physical conduits link them together, so long as the bits are delivered quickly enough for the relevant software programs to run properly. And, for the most part, the Internet's physical infrastructure has not traditionally "cared" what software programs those bits are associated with; it just delivers the 1s and 0s and lets the computers do the rest. In part because "a bit is just a bit" in this sense, the Internet severs any strong logical or practical link between communications *services* and the physical *media* over which they are transmitted to consumers.

For the telecommunications market to function efficiently, this comprehensive technological convergence must be matched by an equally comprehensive *regulatory* convergence. Except where lingering natural monopoly conditions make one provider dominant in a particular market, like services should generally be regulated alike, no matter what physical medium is used to provide them. Consider a rough analogy. Perhaps it made sense to regulate the incumbent railroad operators heavily in the days when railroad tracks were genuine monopoly facilities, before the interstate highways made trucking a feasible alternative for many customers with long haul transportation needs. But it made less sense to regulate the railways as heavily once trucking became a vibrant source of competition.

Similar considerations apply in the telecommunications industry. Take, for example, the case of telephony, the transmission of ordinary voice conversations between two or more people. Cable television companies have begun invading the telephone companies' core markets by offering subscribers voice services of their own, most recently in the form of VoIP appli-

cations that ride on top of the cable companies' broadband Internet platform. Even when cable companies do not themselves offer voice services, stand-alone VoIP providers like Vonage are happy to sell them directly to consumers as one broadband application among many. And wireless telephone service adds another dimension of cross-platform competition to the mix. Increasing numbers of Americans have begun "cutting the cord" by relying *entirely* on their wireless phone for all of their voice communications, a development facilitated by the FCC's recent decision to enable consumers to take their wireline telephone numbers with them when they sign up for wireless service, as discussed in chapter 8.

Eventually, cross-platform competition may so thoroughly deprive the wireline telephone companies of their traditional market power that it will no longer make sense to think of them—or regulate them—as natural monopoly providers of voice services. As it happens, Congress anticipated in 1996 that cable companies would begin providing ordinary telephone service to their customers, and it took steps to make sure that they would receive no special advantages or disadvantages in so doing. What Congress did *not* foresee is that telephone companies and cable companies would soon compete in a different and potentially more important market: the market for providing broadband Internet access. Cable companies provide their version of such access (cable modem service) over the same facilities they use to provide ordinary cable television service. Similarly, telephone companies provide their version (DSL) over ordinary telephone lines. The two services are market substitutes, and they are offered to the public in fierce head-to-head competition. But they are not regulated alike: telephone companies providing DSL are currently subject to burdensome wholesale regulations to which cable companies providing cable modem service are not subject, even though cable providers have a larger share of the U.S. residential broadband market than telephone companies.

The story of broadband regulation, discussed in chapters 5 and 6, is important not just because it exemplifies the tenacious influence of obsolete regulatory assumptions in the age of convergence, but also because the government's resolution of the "regulatory parity" debate, whenever it comes, will dramatically affect the future of the telecommunications industry as a whole. Data traffic used to constitute a tiny percentage of the signals flowing over a voice-centric network; soon, however, voice traffic will become just a small minority population of bits flowing over a data-centric

network. More generally, the last link between technological platforms and particular services will be weakened, if not severed, once all applications are carried as indistinguishable bit-streams over different platforms. As we approach that date, a regulatory regime that still treats substitutable platforms differently will distort the marketplace by, among other things, creating artificial regulatory advantages for one set of competitors over another. For the most part, policymakers know this. But, as we shall see, the entrenched commercial interests that benefit from the regulatory status quo make it politically difficult for policymakers to fix the problem by overhauling the rules.

* * *

One of the more dispiriting moments in the writing of this book came in a local Starbucks, where a friendly middle-aged woman pointed at the laptop on which these words were written and asked what the book was about. Upon learning that it was about telecommunications policy, she made a face. Then, when prompted to explain herself, she volunteered that she found the whole telecommunications industry confusing: she missed the simpler times, when one company—Ma Bell—served all needs and sent out unitary bills that ordinary people could understand. She is not alone. Millions of Americans wonder whether all this technological and regulatory upheaval is "worth the candle," as Justice Stephen Breyer (a former professor of regulatory law) has mused.[36]

In essence, this question asks whether the benefits of introducing competition to this previously monopolized industry warrant the tumult that such competition entails. In general, government management of a monopoly regime inevitably produces not just waste, but also a maze of politically expedient yet economically artificial regulatory distinctions. Economic competition finds and destroys each such distinction and destabilizes the whole regulatory house of cards. For example, as discussed in chapters 2 and 10, competition in the markets for business and long distance services has undermined the traditional universal service regime of implicit cross-subsidies. Business and long distance customers traditionally paid the telephone monopolist above-cost rates to subsidize below-cost rates for basic local service in some areas. But once business and frequent long distance callers have a choice of telecommunications carriers, and once they learn they can send by e-mail what they would otherwise send through expen-

sive hour-long fax transmissions over traditional telephone networks, they will no longer buy the erstwhile monopolist's services at the inflated prices that traditionally supported other people's low phone rates. The ultimate result is either an increase in those rates or a proliferation of confusing tax-like fees that appear on telephone bills. From an economic perspective, either result is much more efficient than the cross-subsidy regime. But each is politically quite unpopular. In the short term, overt price hikes and new line-item fees tend to attract far more controversy than adherence to a quietly inefficient (albeit ultimately unsustainable) scheme in which retail rates stay at more or less the same levels but, unbeknownst to the ordinary consumer, bear no rational relationship to underlying costs.

To be sure, today's regulatory climate would be simpler if Congress had acted more decisively in drafting the Telecommunications Act of 1996, a crazy-quilt of ambiguous provisions designed, as we shall see, to leave many of the important questions unanswered so as to offend no powerful interest groups. And the world would also be simpler if Americans had kept their perspective during the Internet gold rush of the late 1990s, instead of cheering on massive overinvestment in certain types of telecommunications infrastructure—such as the unused fiber-optic capacity known as "dark fiber"—on the catastrophically misguided assumption that "supply will create its own demand." The result of that overinvestment, as everyone knows, was a string of corporate scandals and bankruptcies several years later. But even if Congress and the business community had exercised better judgment in the waning years of the twentieth century, the growth of competition still would have generated litigation and economic displacement. The question remains: is facilitating competition worth the candle?

In the long run, the answer is surely yes. The very premise of capitalism is that a competitive market, as compared to a monopolistic one, creates more innovation, greater product variety, increased efficiency, lower costs, and lower average prices. The telecommunications market is no exception to this rule. For example, AT&T deployed very little optical fiber in its long distance network until its new rivals—specifically, MCI and Sprint—placed a bet on that new technology, ordered materials and equipment from Corning, and advertised the "pin drop" clarity of their long distance services as compared to AT&T's. Moreover, competition not only keeps monopolists from complacency, but removes any incentive they may have to withhold the deployment of new services that could "cannibalize"

their less efficient but more profitable old services. For example, the growth of cable modem service and other broadband options appears to have helped induce incumbent telephone companies to roll out broadband DSL services more vigorously than they otherwise might because, in the *absence* of competition, they would make more money if they continued to sell the previous generation of often less efficient transmission technologies.

Even apart from technological improvements, competition also leads to marketing innovations. For example, competition among wireless companies has not only driven wireless prices down, but also revolutionized the very structure of pricing for voice services. Depending on your expected usage, you can choose a wireless plan with a low monthly fee, relatively few "free" minutes, and extra charges for roaming and long distance; or you can buy a plan with a higher monthly fee, a bucket of virtually unlimited "free" minutes, and no extra charge for roaming or long distance; or you can purchase any number of plans with variations on these pricing themes. What's more, if you're reasonably happy with your wireless service, you can, as noted, "cut the cord" of your conventional wireline service, as many people, most of them young, have already done. Indeed, wireless offers a key feature that, by definition, landline service cannot: mobility.

This raises an intriguing question. As discussed in chapters 7 and 8, wireless services have not yet made wireline voice services superfluous. This is mostly because of quality concerns stemming from, first, zoning restrictions on the placement of antennas and, second, the government's limitations on the radio spectrum available to commercial wireless carriers. These quality concerns will probably abate over time, however, with innovations in both wireless technology and federal spectrum policy. Once a critical percentage of customers in a given market considers wireless service (at least) a substitute for wireline service, why would it make sense to continue regulating any wireline service in that market more than wireless service, which is regulated hardly at all?

That question points to light at the end of the regulatory tunnel. The cut-throat rivalry among multiple companies in the wireless market promotes the interests of consumers in that market far better than any regulator could. The ultimate aspiration of telecommunications policy is to do for the telecommunications industry *generally* what the FCC's deregulatory policies have helped do for the wireless sector *specifically*. Imagine a world

in which neither the telephone company nor the cable company nor any other company could exercise market power in the provision of any telecommunications-related service because technological innovation has supplied alternative, facilities-based platforms for each such service. In that world, little regulatory significance would attach to categories like "local," "long distance," "voice," or "data"—or even "telephone" or "cable." A call would just be a call, a carrier would just be a carrier, and a bit would just be a bit. Getting from here to there is every bit as complicated as it is important. Illuminating that path is the project of this book.